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Docket No.: GR 99 P 5374

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**MAIL STOP: APPEAL BRIEF-PATENTS**By:  \_\_\_\_\_  
Ralph E. LocherDate: July 25, 2007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
Before the Board of Patent Appeals and Interferences

Applic. No.	:	09/729,069	Confirmation No.:	6450
Inventor	:	Nicolas Nagel, et al.		
Filed	:	December 4, 2000		
Title	:	Microelectronic Structure and Method of Fabricating it		
TC/A.U.	:	2818		
Examiner	:	David Vu		
Customer No.	:	24131		

Hon. Commissioner for Patents  
Alexandria, VA 22313-1450

**BRIEF ON APPEAL**

Sir:

This is an appeal from the final rejection in the Office action dated February 28, 2007, finally rejecting claims 1, 2, 4, 10, 12, and 14 - 16.

Appellants submit this *Brief on Appeal*, including payment in the amount of \$500.00 to cover the fee for filing the *Brief on Appeal*.

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**Real Party in Interest:**

This application is assigned to INFINEON TECHNOLOGIES AG of Munich, Germany. The assignment will be submitted for recordation upon the termination of this appeal.

**Related Appeals and Interferences:**

No related appeals or interference proceedings are currently pending which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

**Status of Claims:**

Claims 1, 2, 4, 10, 12, and 14 - 16 are rejected and are under appeal. Claims 3, 5-9, 11, 13, and 17-23 have been canceled.

**Status of Amendments:**

No Claims were amended after Final Office Action.

**Summary of the Claimed Subject Matter:**

The subject matter of each Independent claim is described in the specification of the instant application. Examples explaining the subject matter defined in each of the independent claims, referring to the specification by page and line numbers, references numbers and to the drawings, are given below.

Independent claim 1 reads as follows:

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A microelectronic structure, comprising:

a base substrate (Fig. 1A - ref # 5; Fig. 2A - ref #s 50, 55; Fig. 3 - ref # 90, see page 21, lines 7-14) at least partially composed of an insulating material (page 21, lines 7-14) and formed with at least one opening (Figs. 1A, 2A, 3 - ref # 10, page 21, lines 7-14);

a barrier layer (Figs. 1C, 2C, 3; ref #s 25, 30, page 23, lines 2-25) provided over said base substrate (ref #s 5; 50, 55; 90), said barrier layer (ref #s 25, 30) including an oxygen-containing iridium layer (ref # 25, page 23, lines 2-4) and an oxygen barrier layer (ref # 30, page 23, lines 21-25), said oxygen barrier layer (ref # 30) being composed of one of iridium dioxide and ruthenium dioxide (page 23, lines 21-25);

an adhesion layer (Figs. 1C, 2C, 3; ref # 20, page 22, lines 4-13) disposed between said base substrate (ref #s 5, 50, 55, 90) and said barrier layer (ref #s 25, 30), said adhesion layer containing at least one material selected from the group consisting of zirconium, hafnium, cerium, vanadium, chromium, and niobium (page 22, lines 4-13); and

a metal silicide layer (Fig. 1A, 2A; ref # 9; page 25, lines 11-18; page 21, lines 7-14) disposed on said base substrate directly between said adhesion layer (ref # 20) and said opening (ref # 10), causing a layer stack of said metal silicide layer (ref # 9), said adhesion layer (ref # 20) and said oxygen-containing barrier layer (ref # 25, 30) to be formed above said opening (ref # 10).

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Grounds of Rejection to be Reviewed on Appeal

1. Whether or not claims 1, 2, 4, 10, 12 and 14 - 16 are obvious over Nishioka et al. (US 5,811,851) under 35 U.S.C. § 103.
2. Whether or not claims 1, 2, 4, 10, 12 and 14 - 16 are obvious over Horii (US 2001/0052466) under 35 U.S.C. § 103.

Arguments:

- I. **Whether or not claims 1, 2, 4, 10, 12 and 14 - 16 are obvious over Nishioka et al. (US 5,811,851) under 35 U.S.C. § 103.**

In item 1 of the final Office Action, mailed February 28, 2007 ("the final Office Action"), claims 1, 2, 4, 10, 12 and 14-16 were rejected under 35 U.S.C. § 103 as allegedly being obvious over U.S. Patent No. 5,811,851 to Nishioka et al. (hereinafter Nishioka).

Appellants respectfully disagree for the below stated reasons.

IA. Appellants' claim 1 is patentable over the Nishioka reference

The invention of the instant application relates to a substrate 5 of an insulating material in which an opening 10 is formed and a stack formed by a metal silicon layer 9, an adhesion layer 20 and a barrier layer 25, 30 formed above the opening 10. The adhesion layer 20 is formed of zirconium, hafnium, cerium, vanadium, chromium, or niobium and is provided for improving adhesion of the barrier layer

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25, 30 to the substrate 5. The barrier layer 25, 30 includes an oxygen-containing iridium layer 25 and an oxygen barrier layer 30.

The stack according to the invention of the instant application has three layers in which the topmost barrier layer 25, 30 is formed from two sub-layers, an oxygen-containing iridium layer 25 and an oxygen barrier layer 30 being either an iridium dioxide layer or a ruthenium dioxide layer.

The Examiner states that Nishioka discloses an adhesion layer 46 and a barrier layer 48 (see Figs. 7 and 8). At the same time, the Examiner has also interprets the adhesion layer 46 as a metal silicon layer 46 (see page 3, top partial paragraph) which is disposed on a base substrate 30 directly between the adhesion layer 46 and an opening, forming a layer stack of a metal silicide layer 46, an adhesion layer 46, and an oxygen-containing barrier layer 48.

Nishioka teaches that the adhesion layer 46 is formed of a ruthenium layer and that an upper surface of the ruthenium layer is oxidized into a ruthenium dioxide layer (see column 6, lines 28-39) forming the oxygen-containing barrier layer 48. A number of other materials can be used as alternatives for those layers (see column 7, line 40 to column 8, line 16 for the ruthenium layer and column 8, lines 62-66 for the ruthenium oxide layer).

For example, the adhesion layer 46 could be iridium oxide and the barrier layer 48 could be an iridium dioxide layer after the oxidation process on the adhesion layer.

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Claim 1 of the instant application recites that the barrier layer 25, 30 includes an "oxygen-containing iridium layer and an oxygen barrier layer". Therefore, the barrier layer 48 of Nishioka must be an iridium-based layer in order to read on this feature of claim 1 of the instant application. As noted in Nishioka, the barrier layer 48 is an oxidized layer of the adhesion layer 46, therefore the adhesion layer 46 must also be an iridium-based layer if the barrier layer is to be an iridium based layer. In other words, as the barrier layer 48 is an oxidized form of the adhesion layer 46, there must be a correlation between the materials forming the layers 46, 48.

In contrast, claim 1 of the instant application recites that the adhesion layer 20 is formed from zirconium, hafnium, cerium, vanadium, chromium, or niobium.

Therefore, the adhesion layer 46 of Nishioka cannot read on the adhesion layer 20 as recited in claim 1 of the instant application. In other words, if the Examiner states that the adhesion layer 46 of Nishioka is indeed one of zirconium, hafnium, cerium, vanadium, chromium, or niobium, then the barrier layer 48 must also be a dioxide of one of zirconium, hafnium, cerium, vanadium, chromium, or niobium and cannot read on the barrier layer recited in the instant application which must include an "oxygen-containing iridium layer". If the Examiner states that the barrier layer 48 of Nishioka is indeed formed of iridium, then the adhesive layer 46 of Nishioka cannot be formed of one of zirconium, hafnium, cerium, vanadium, chromium, or niobium.

In addition, the Examiner recites that the adhesion layer 46 of Nishioka also reads on the metal silicide layer 9 recited in claim 1 of the instant application (in addition

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to being the adhesion layer). First, we note that claim 1 of the instant application recites two layers, the first layer being the adhesion layer 20 and the second layer 9 being the metal silicide layer 9. We note that the adhesion layer 20 does not recite any silicon and therefore is not a metal-silicide layer. Should the Examiner state that the adhesion layer 20 is a metal layer and the claim language is open (e.g. comprising), so as not to preclude a silicon additive resulting in a metal-silicide layer, we note that the adhesion layer 46 of Nishioka still forms the barrier layer and must have an iridium metal content which is in contrast to a metal silicide where the metal is limited to zirconium, hafnium, cerium, vanadium, chromium, or niobium.

In summary, as the barrier layer 48 is a dioxide of the adhesion layer 46 in Nishioka, they must be formed from the same base metal and cannot read on claim 1 of the instant application which requires two different metals (one for the barrier layer 48 and a different one for the adhesion layer).

II. **Whether or not claims 1, 2, 4, 10, 12 and 14 - 16 are obvious over Horii (US 2001/0052466) under 35 U.S.C. § 103.**

In item 2 of the final Office Action, mailed February 28, 2007 ("the final Office Action"), claims 1, 2, 4, 10, 12 and 14-16 were rejected under 35 U.S.C. § 103 as allegedly being obvious over U.S. Patent Publication No. 2001/0052466 to Horii (hereinafter Horii).

Appellants respectfully disagree for the below stated reasons.

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IIA. Appellants' claim 1 is patentable over the Horii reference

The Examiner also interpreted Horii in the same way as he interpreted Nishioka, namely assigning alternative materials for one layer to several layers. As viewed by the Examiner, Horii teaches a base substrate 10, 12 having an insulating layer 12 with an opening formed therein. A conductive material 14 fills the opening. Horii further teaches at least one barrier layer 22 including an oxygen-containing iridium layer 22 and an oxygen barrier layer 22 and an adhesive layer 20 disposed between the barrier layer 22 and the base substrate 10, 12. The adhesive layer 20 is formed from a metal nitride or a metal silicide (see [0021]) which is applied with a sputtering process. The Examiner also appears to be stating that the adhesive layer 20 also qualifies as a metal silicide layer. The Examiner then states it would be obvious to substitute zirconium, hafnium, cerium, vanadium, chromium, or niobium for either a metal nitride or a metal silicide to form the adhesive layer 20. First, there is nothing in Horii to teach, suggest or hint that the adhesive layer 20 should be a two part layer, the first part formed of a metal selected from zirconium, hafnium, cerium, vanadium, chromium, or niobium and the second part to be a metal silicide. Not only is the Examiner substituting materials he is also adding a second layer formed of a different material.

A critical step in analyzing the patentability of claims pursuant to 35 U.S.C. § 103 is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614,1617 (Fed. Cir. 1999). Close adherence to this methodology is



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especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Most if not all inventions arise from a combination of old elements. See In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See id. However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See id. Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the appellant. See In re Dance, 160 F.3d 1339, 1343, 48 USPQ2d 163.5, 1637 (Fed. Cir. 1998); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the

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problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein). Whether the Examiner relies on an express or an implicit showing, the Examiner must provide particular findings related thereto. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. Broad conclusory statements standing alone are not "evidence." Id. When an Examiner relies on general knowledge to negate patentability, that knowledge must be articulated and placed on the record. See In re Lee, 277 F.3d 1338, 1342-45, 61 USPQ2d 1430, 1433-35 (Fed. Cir. 2002).

Upon evaluation of the Examiner's comments, it is respectfully believed that the evidence adduced by the Examiner is insufficient to establish a prima facie case of obviousness with respect to the claims. Accordingly, the Examiner suggests two critical steps not taught in Horii. First, Horii does not teach the metals recited in claim 1 of the instant application. Second, Horii does not teach an adhesive layer formed of two layers, a first layer formed from zirconium, hafnium, cerium, vanadium, chromium, or niobium and a second layer formed of a metal-silicide. Nor would it be obvious to one of average skill in the art to make the recited combination of two layers of two separate materials.

The honorable Board is therefore respectfully urged to reverse the final rejection of the Primary Examiner.

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If an extension of time is required for this submission, petition for extension is herewith made. Any fees due should be charged to Deposit Account No. 12-1099 of Lerner Greenberg Sterner LLP.

Respectfully submitted,



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/lq

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Claims Appendix:

1. A microelectronic structure, comprising:

a base substrate at least partially composed of an insulating material and formed with at least one opening;

a barrier layer provided over said base substrate, said barrier layer including an oxygen-containing iridium layer and an oxygen barrier layer, said oxygen barrier layer being composed of one of iridium dioxide and ruthenium dioxide;

an adhesion layer disposed between said base substrate and said barrier layer, said adhesion layer containing at least one material selected from the group consisting of zirconium, hafnium, cerium, vanadium, chromium, and niobium; and

a metal silicide layer disposed on said base substrate directly between said adhesion layer and said opening, causing a layer stack of said metal silicide layer, said adhesion layer and said oxygen-containing barrier layer to be formed above said opening.

2. The microelectronic structure according to claim 1, wherein:

said at least one opening completely penetrates said insulating material; and

at least one conductive material fills said at least one opening.

3 (cancelled).

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4. The microelectronic structure according to claim 1, wherein said insulating material is composed of one of silicon nitride and silicon oxide.

5-9 (cancelled).

10. The microelectronic structure according to claim 1, including a metal-containing electrode layer covering said oxygen barrier layer.

11 (cancelled).

12. The microelectronic structure according to claim 2, wherein:

said at least one conductive material is disposed in said at least one opening.

13 (cancelled).

14. The microelectronic structure according to claim 1, wherein said metal silicide layer contains at least one silicide selected from the group consisting of yttrium silicide, titanium silicide, zirconium silicide, hafnium silicide, vanadium silicide, niobium silicide, chromium silicide, iron silicide, cobalt silicide, palladium silicide, platinum silicide and copper silicide.

15. The microelectronic structure according to claim 10, including a metal-oxide-containing layer covering said metal-containing electrode layer, said metal-oxide-containing layer being a layer selected from the group consisting of a dielectric

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metal-oxide-containing layer, a ferroelectric metal-oxide-containing layer and a paraelectric metal-oxide-containing layer.

16. The microelectronic structure according to claim 1, further comprising a noble metal layer disposed on said barrier layer.

17-23 (cancelled).

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**Evidence Appendix:**

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or any other evidence has been entered by the Examiner and relied upon by appellant in the appeal.

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Related Proceedings Appendix:

No prior or pending appeals, interferences or judicial proceedings are in existence which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal. Accordingly, no copies of decisions rendered by a court or the Board are available.

Related Proceedings Appendix: Page 1 of 1.